

3D printing helps New Balance fulfill “Always in Beta” tagline

Selective Laser Sintering with DuraForm® Flex TPU material delivers first 3D printed midsoles for a high-performance running shoe

3D Systems ColorJet Printing empowers culture of relentless innovation by enabling full-color prototypes within hours



The New Balance Zante Generate, the world's first high-performance running shoe with a full-length 3D printed midsole. Forty-four of these shoes were produced by 3D Systems Selective Laser Sintering (SLS) printers using DuraForm® Flex TPU material.

In the summer of 2015, the 109-year-old sportswear manufacturer New Balance encapsulated its culture of relentless innovation with a fitting slogan: “Always in Beta”.

Nine months later, New Balance put pay to those words with Zante Generate, the world's first high-performance running shoe with a full-length 3D printed midsole. In tribute to chairman Jim Davis' 44 years of New Balance ownership, 44 pairs of the shoe were produced at the company's Lawrence, Massachusetts, facility in collaboration with 3D Systems.

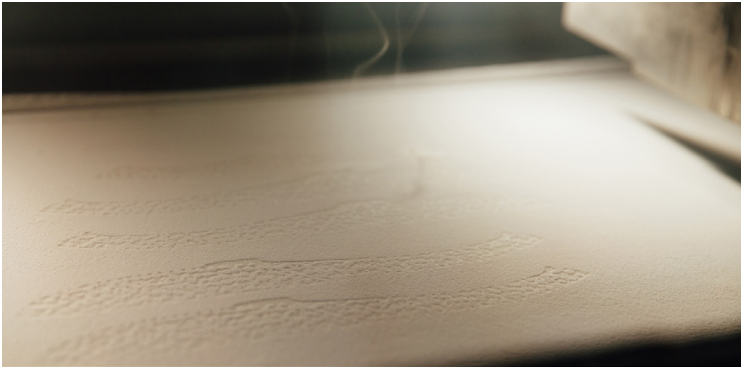
The Zante Generate was made possible by 3D Systems Selective Laser Sintering (SLS) printers and DuraForm® Flex TPU material. For the day-to-day quest to fulfill the “Always in Beta” philosophy, New Balance relies on 3D Systems ColorJet Printing (CJP) for color and form prototyping.

Just like the real thing

As its name suggests, a midsole is the part of the shoe between the outsole—the bottom of the shoe that touches the ground—and the upper, the part of the shoe that wraps around the top of the foot. It provides the vital functions of cushioning and supporting the foot.

New Balance has used 3D Systems ProJet® x60 ColorJet printers for more than 15 years to produce midsole prototypes that help the company assess design aesthetics throughout the product development process.

“The prototypes show designers what the midsole will look like in real life,” says Daniel Dempsey, Rapid Prototyping and Manufacturing Engineer for New Balance. “Looks can be very deceptive in a CAD model, but a CJP prototype is as close as you can get to the appearance of the real thing.”



New Balance uses 3D Systems sPro SLS printers to produce prototypes in DuraForm Flex TPU material that provides the same properties as the foam used in manufactured shoes.

Igniting a cultural change

Dempsey says the principal asset of the 3D Systems CJP machines is the ability to produce full-color models quickly and cost effectively. In the course of a year, the ColorJet systems enable New Balance to do hundreds of additional design iterations.

Before CJP, New Balance and other shoe makers had to create wooden models or an aluminum mold for manufacturing a prototype of a particular design. The models required hand painting and took about two to three weeks to make at a cost of around \$1,000 per model.

“The ability to print something, look at it and hold it in your hands the same day versus weeks to get a model created has sped up our product development cycle tremendously,” says Dempsey.

The increased speed and accuracy of 3D printing has ignited a cultural change that gives New Balance designers the freedom to experiment without the burden of high prototyping costs and lengthy turnaround times.

“Our designers are always trying something different and new that no one else has done before,” says New Balance CJP Technician Ed Rodriguez. “The CJP’s allow us to try anything we like without having to worry about getting it right the first time.”

Rodriguez estimates that New Balance will prototype 1,000 models this year on the CJP printers and probably increase that number to 1,300 next year.

“If we get a print request early in the morning,” says Rodriguez, “we can have a print ready in the early afternoon for a designer to review, after which design changes can be made and another print produced before the end of the day. We’re running the ProJet x60s every week and sometimes on weekends when we get busy.”

Achieving an optimal balance

3D Systems sPro™ 60 SLS printers complement ColorJet printers by producing prototypes in DuraForm Flex TPU material that provides the same properties as the foam used in manufactured shoes. This enables New Balance to test the performance and durability of new designs before committing to manufacturing.

“Elastomers such as DuraForm Flex TPU weren’t available five or six years ago,” says Dempsey. “We can now prototype in structures that mimic the look and feel of foam.”



A 3D Systems ColorJet print of the New Balance 1260 V2 model shoe, showing design details and the range of colors available to visualize data with realistic prototypes.

With the Zante Generate, sPro printers went beyond prototyping to manufacturing of finished midsoles for consumers.

New Balance used complex organic geometry to design the Zante Generate midsoles in a way that would be impossible to manufacture using traditional molding processes. sPro 60 printers applied layer after layer of Duraform Flex TPU material in the exact proportions required to provide optimum support with minimal material waste.

According to New Balance, the midsoles for the Zante Generate “leverage the benefits of 3D printing and breakthroughs in available materials to achieve an optimal balance of flexibility, strength, weight and durability in an intricate honeycomb midsole structure.”

Enabling data-driven development

Advances by 3D Systems in CJP and SLS are helping New Balance carry out data-driven initiatives that Dempsey believes are important differentiators. The company is not just designing around static form, fit and aesthetics, but basing its products on individualized motion data collected in the sports lab of its Lawrence facility.

Using technologies such as pressure plates, in-shoe sensors and high-speed 3D motion cameras, New Balance can capture a range of biometric data, including pressure distribution and the way the foot falls while an athlete is running. The data is being used to create individualized shoe designs for Olympic athletes and UK soccer teams sponsored by New Balance.

“We can vary our designs to match your biomechanical data exactly, to the point where design features for your left shoe are different from your right,” says Dempsey.

A shoe to call your own

New Balance has big plans for other shoes customized with 3D printing, but that’s only the beginning for the company that’s “always in beta.”

Dempsey believes that the era of individualized, direct-to-market 3D printed products could happen within the next few years, meaning the form, fit and function of your athletic shoes could soon be based on the unique biomechanics of your own two feet.



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